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Nota di contenuto	1. An Overview of the Content -- Part I: Scalar Radiative Transfer Equations -- 2. Radiative Transfer Equations -- 3. Exact Methods of Solution: A Brief Survey -- 4. Singular Integral Equations -- 5. The Scattering Kernel and Associated Auxiliary Functions -- 6. The Surface Green Function and the Resolvent Function -- 7. The Emergent Intensity and the Source Function -- 8. Spectral Line with Continuous Absorption -- 9. Conservative Scattering: The Milne Problem -- 10. The Case Eigenfunction Expansion Method -- 11. The -law and the Nonlinear H-Equation -- 12. The Wiener–Hopf Method -- Part II: Scattering Polarization -- 13. The Scattering of Polarized Radiation --

14. Polarized Radiative Transfer Equations -- 15. The -law, the Nonlinear H-Equation, and Matrix Singular Integral Equations. 16. Conservative Rayleigh Scattering: Exact Solutions -- 17. Scattering Problems with No Exact Solution I: The Auxiliary Matrices -- 18. Scattering Problems with No Exact Solution II: The Resolvent Matrix, the H-Matrix, and the I-Matrix -- Part III: Asymptotic Properties of Multiple Scattering -- 19. Asymptotic Properties of the Scattering Kernel K() -- 20. Large Scale Radiative Transfer Equations -- 21. The Photon Random Walk -- 22. Asymptotic Behavior of the Resolvent Function -- 23. The Asymptotics of the Diffusion Approximation -- 24. The Diffusion Approximation for Rayleigh Scattering -- 25. Anomalous Diffusion for Spectral Lines -- 26. Asymptotic Results for Partial Frequency Redistribution.

Sommario/riassunto

This book discusses analytic and asymptotic methods relevant to radiative transfer in dilute media, such as stellar and planetary atmospheres. Several methods, providing exact expressions for the radiation field in a semi-infinite atmosphere, are described in detail and applied to unpolarized and polarized continuous spectra and spectral lines. Among these methods, the Wiener–Hopf method, introduced in 1931 for a stellar atmospheric problem, is used today in fields such as solid mechanics, diffraction theory, or mathematical finance. Asymptotic analyses are carried out on unpolarized and polarized radiative transfer equations and on a discrete time random walk. Applicable when photons undergo a large number of scatterings, they provide criteria to distinguish between large-scale diffusive and non-diffusive behaviors, typical scales of variation of the radiation field, such as the thermalization length, and specific descriptions for regions close and far from boundaries. Its well organized synthetic view of exact and asymptotic methods of radiative transfer makes this book a valuable resource for both graduate students and professional scientists in astrophysics and beyond.